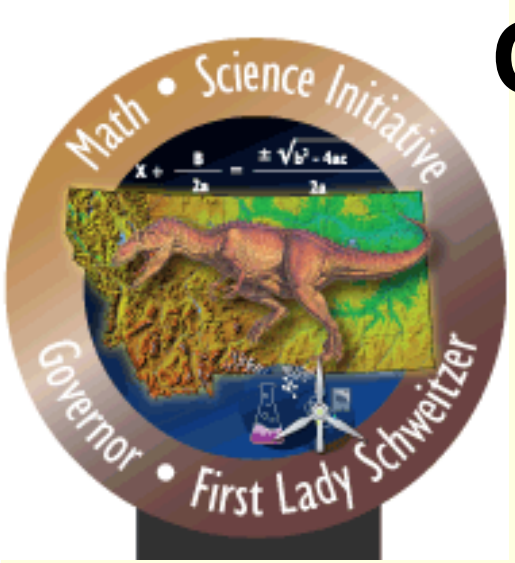


Governor and First Lady's Math & Science Initiative

The Roadside Geological Markers

Montana Governor's Conference
on Tourism and Recreation
West Yellowstone, April 18, 2008

Governor and First Lady's Math & Science Initiative

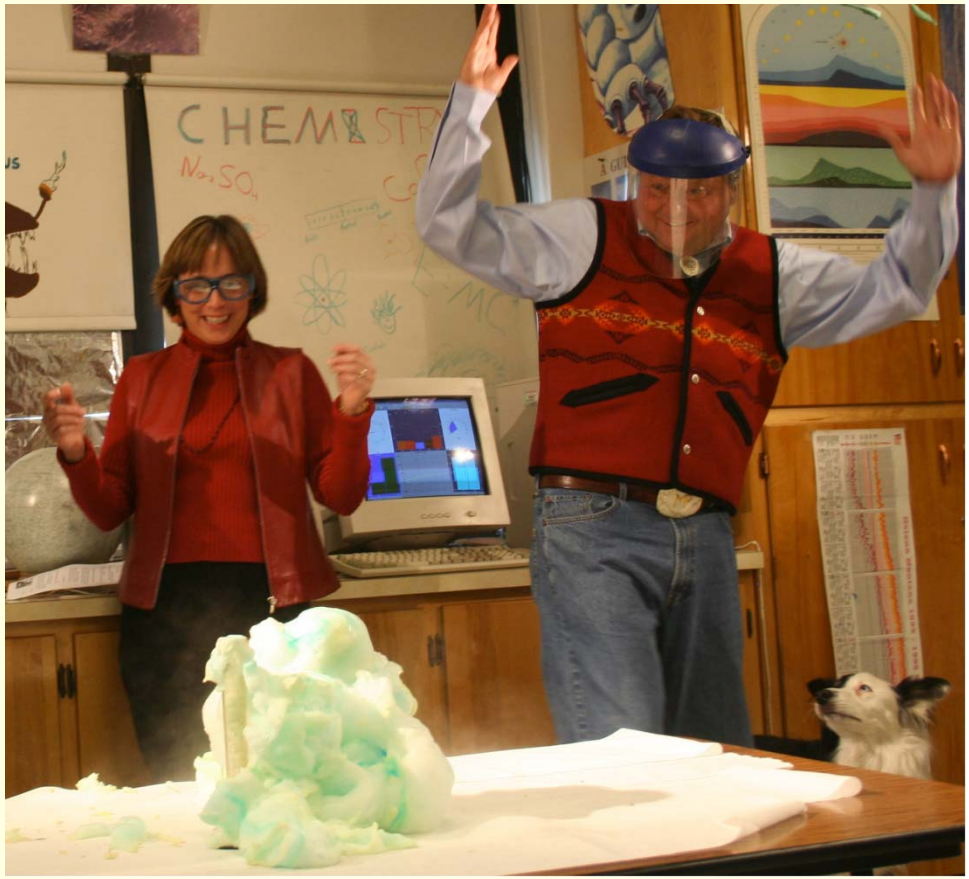
Spark an interest in Math and Science

K 1 2 3 4 5 6 7 8 9 10 11 12

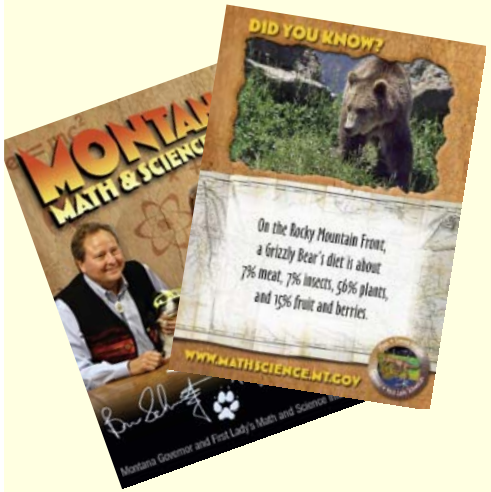
Students self-select out of the math/science pipeline around 5th/6th grade

Governor and First Lady's Math & Science Initiative

- Encourage hands-on learning in the classroom and beyond
- Prepare students for exciting jobs in Montana
- Support Governor's Energy Vision

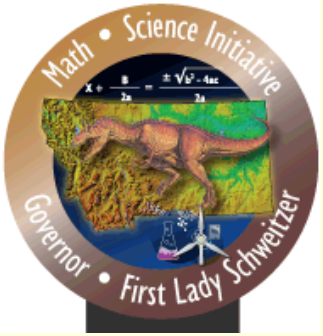


Governor and First Lady's Math & Science Initiative



Math & Science Trading cards

Geological Roadsigns

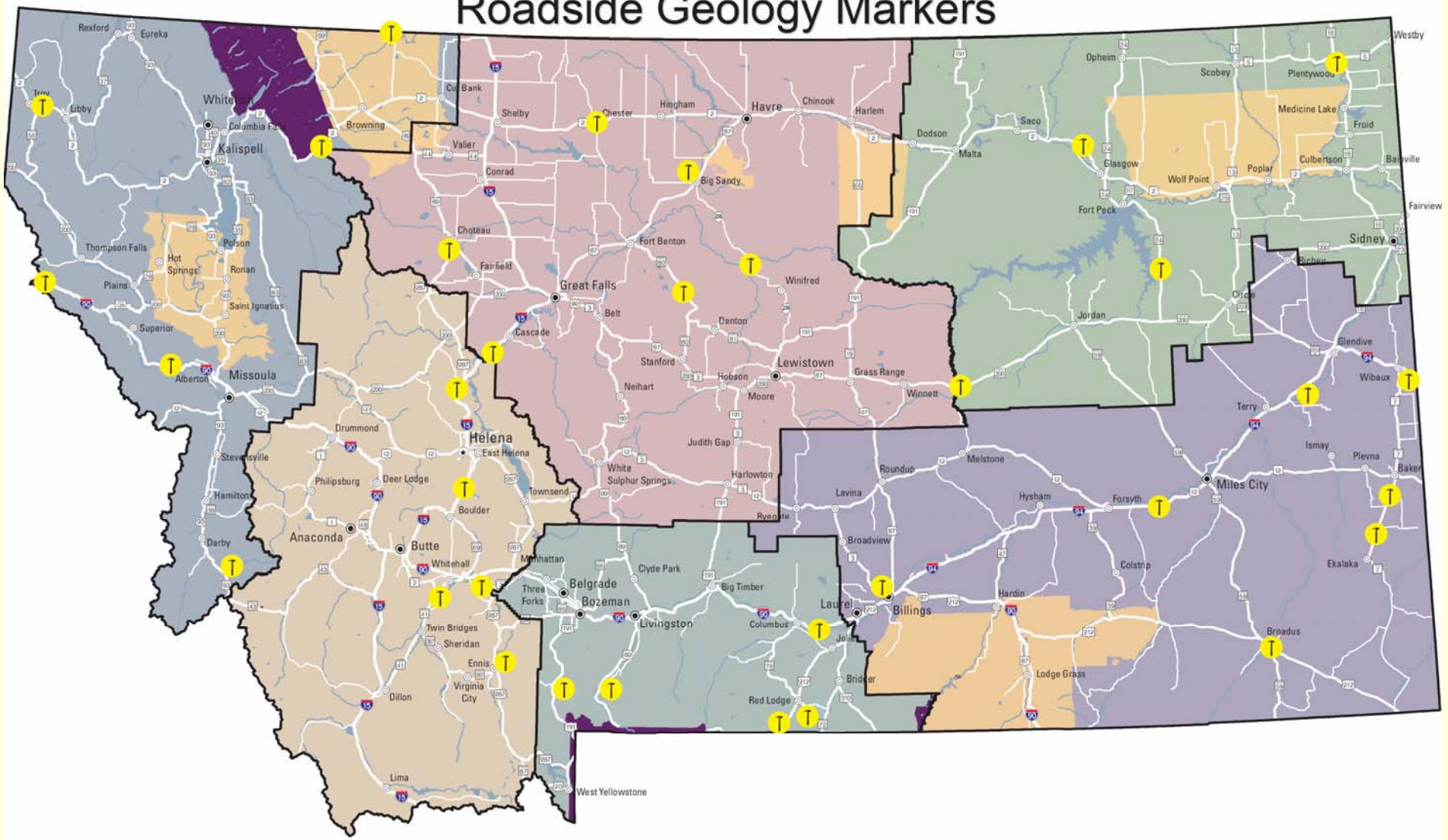


Governor and First Lady's Math & Science Initiative

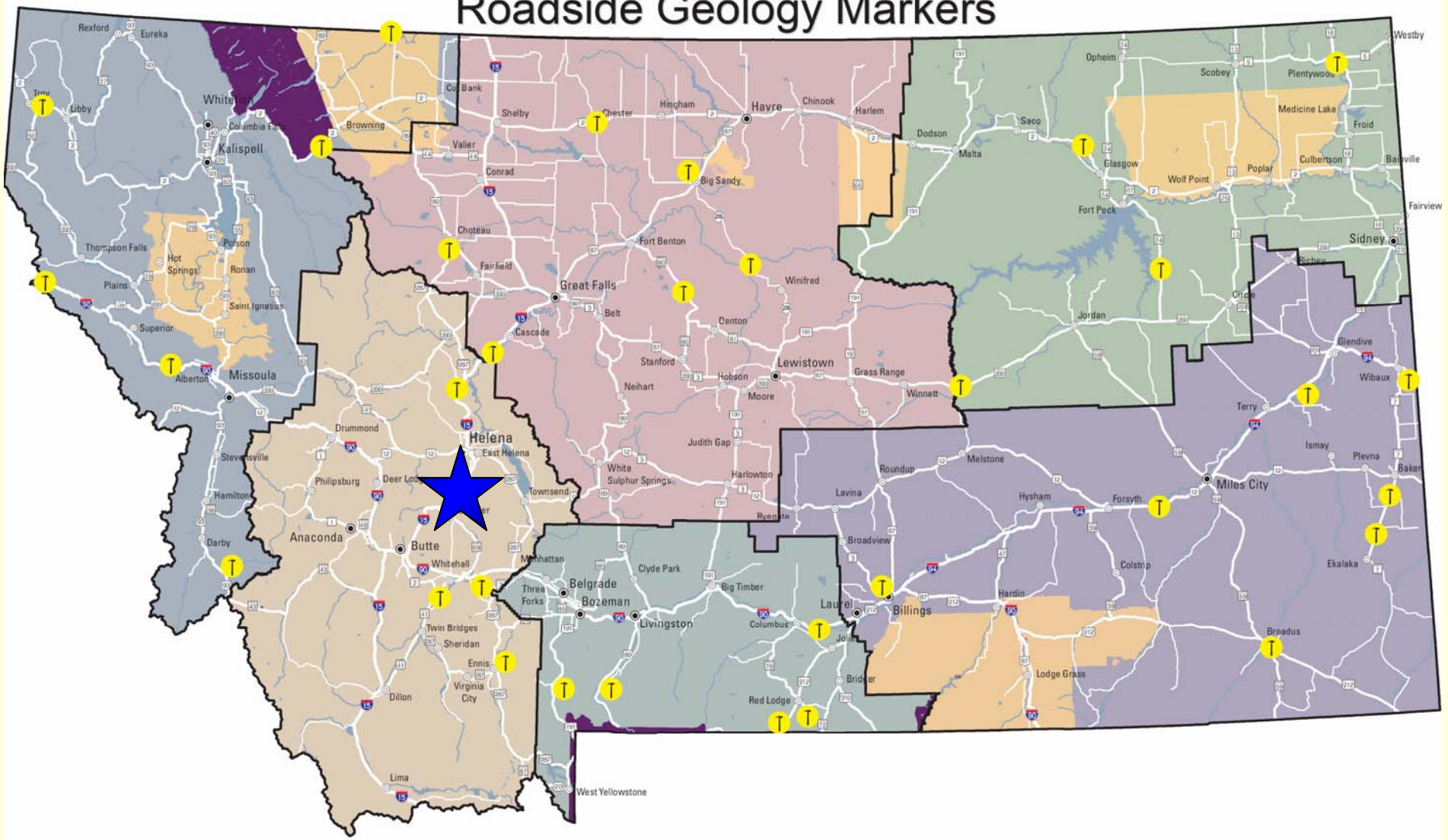
Explore Montana's Big Backyard…

- 16 Geological Roadsign Markers
- Launching 16 more Spring 2008

Roadside Geology Markers



Roadside Geology Markers

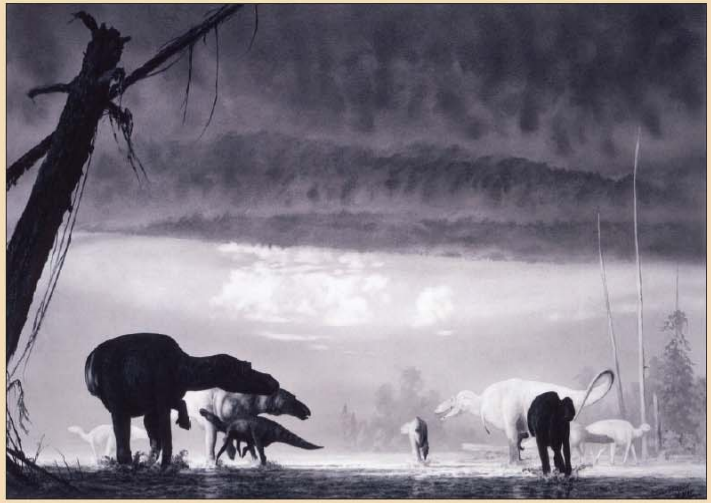


Elkhorn Mountain Volcanoes
and the Boulder Batholith

Montana Department of Transportation

The story of the Elkhorn Mountains Volcanics and the Boulder Batholith is the story of how molten magma or melted rock rising up through the crust of the earth just kept coming and coming and coming—from about 81 to about 74 million years ago. Magma that reached the surface created violent explosions, hurling chunks of rock, cinders, and volcanic ash into the air. At times it "rained" droplets of melted rock. Great clouds of volcanic ash were carried by the wind to the east and buried many animals. The dinosaur fossils in the Two Medicine Formation near Choteau owe their preservation to eruptions of the Elkhorn Mountains Volcanics. The volcanic field was enormous–about 100 miles in diameter and up to 3 miles thick. After the pile of volcanic rocks got so thick, magma stopped going all the way to the surface and just accumulated near the bottom of the pile. So much magma intruded at this level that it formed a body of granitic rock that now extends from Helena to Butte and is known as the Boulder Batholith. You are now in the middle of the Boulder Batholith and the Elkhorn Mountains Volcanics.

The magma was generated because one of the tectonic plates under the Pacific Ocean was subducted under Western North America. Approximately 10,000 miles of the Farallon Plate moved under Montana. This is one of places where it was easy for magma to reach the surface.



Painting by Doug Henderson

Geo-Activity:

- How many things can you find that are made from gold, silver, copper. Hint: Look in pockets, on fingers, and in mouths. What are the characteristic colors of these metals?

Geo-facts

- Seismic and gravity studies show that the Boulder Batholith extends down to a depth of approximately 10 miles. The volume of granitic rock in this batholith is measured in tens of thousands of cubic miles.
- When the Elkhorn volcanoes erupted about 81 to 74 million years ago, they spewed ash as far away as central Montana and killed dinosaurs as far away as Egg Mountain near Choteau.
- Some of the richest gold, silver, and copper mines in Montana are located on the Boulder batholith.

The magma contained many metals. As the granite formed cooling cracks, hot solutions squirted into the cracks to form veins with copper (near Butte) and gold (in this area). Millions of years later weathering of the granite allowed gold in the veins to wash down to the gravels in the valley floor. A gold dredge chewed through the gravels of Prickly Pear Creek beginning in 1938. Mounted on a barge floating on a 30-foot deep pond, the machinery consisted of a chain of buckets that dumped the gravel on a maze of screens and sluices inside the dredge. In its wake, the dredge left behind a "churned up" landscape. In some places scrub brush holding the gravel piles together is still the only vegetation. Although the dredge shut down permanently in the mid-1960's, it was not until the early 1970's that a South American mining company purchased it and moved it to Bolivia.

Old gold dredge, Jefferson City, 1971.
Photograph by Peter J. Meloy. Montana Historical Society, Helena.

Governor and First Lady's Math & Science Initiative

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- Description of Geological Formation

Governor and First Lady's Math & Science Initiative

- How Geology Shaped Montana's Roads and History

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Governor and First Lady's Math & Science Initiative

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Governor and First Lady's Math & Science Initiative

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and the Boulder Batholith

Montana Department of Transportation

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Old gold dredge, Jefferson City, 19[illegible]
Photograph by Peter J. Mehringer, [illegible] Historical Society, Helena

Governor and First Lady's Math & Science Initiative

- **Montana's Highways are the hallways to our schools**

Governor and First Lady's Math & Science Initiative

Launching a Roadside Geological Marker . . .

Egg Mountain sign, near Choteau

Governor and First Lady's Math & Science Initiative

Invite a local classroom

Students from Ekalaka Elementary School

Governor and First Lady's Math & Science Initiative

Invite a guest speaker

Rebecca Hanna, Paleontologist

Governor and First Lady's Math & Science Initiative

First Lady Nancy Schweitzer and MDT Director Jim Lynch

Governor and First Lady's Math & Science Initiative

- **Kids exposed to geology in their own backyard**

Medicine Rocks State Park

Governor and First Lady's Math & Science Initiative

- **Encourage families to learn about MT's unique geological history while traveling the state**

Medicine Rocks State Park

Governor and First Lady's Math & Science Initiative

To learn more…

mathscience.mt.gov

Students from Napi Elementary School, Browning